

WHAT IS CLAIMED IS:

1. An exposure apparatus comprising an optical system having a plurality of spaces and a mechanism that fills each of the spaces with a gas,

5 wherein a gas contained at least in one of the plurality of spaces has a refractive index different from that of a gas contained at least in one of the remaining spaces, and

10 wherein a pressure of the gas at least in the one of the plurality of spaces is different from that of the gas at least in the one of the remaining spaces.

2. The apparatus according to claim 1, wherein the optical system comprises a plurality of optical elements, a holding member for holding the optical  
15 elements, and a vessel for accommodating the optical elements and the holding member, the vessel having the plurality of spaces inside.

3. The apparatus according to claim 1, wherein at least two of the plurality of spaces are adjacent to  
20 each other.

4. The apparatus according to claim 1, wherein the pressure difference between the plurality of spaces is a small pressure difference of not more than 1,000 Pa.

5. The apparatus according to claim 1, wherein when  
25 an influence of an index change rate of the gas at least in the one space on an optical characteristic of the optical system is larger than an influence of an

09319550.080304  
FOI 000005861650

index change rate of the gas at least in the one of the remaining spaces on the optical characteristic of the optical system, the pressure of the gas at least in the one space is higher than that of the gas at least on the one of the remaining spaces.

6. The apparatus according to claim 2, wherein the vessel has at least one gas supply port for independently supplying the gas to each of the plurality of spaces and one gas exhaust port for exhausting the gas.

7. The apparatus according to claim 6, wherein the vessel has a closed structure having no opening portion except for the gas supply port and gas exhaust port.

8. The apparatus according to claim 6, characterized by further comprising

a detection section for detecting an internal pressure of the vessel, and

an operation section for operating the internal pressure in accordance with an output from said detection section.

9. The apparatus according to claim 1, wherein the plurality of gases with different refractive indices are helium and nitrogen.

10. The apparatus according to claim 1, wherein each of the plurality of gases with different refractive indices is a single gas or a mixture of gases of a plurality of types.

11. A semiconductor device manufacturing method comprising the steps of:

installing manufacturing apparatuses comprising an optical system having a plurality of spaces and a mechanism that fills each of the spaces with a gas, a gas contained at least in one of the plurality of spaces has a refractive index different from that of a gas contained at least in one of the remaining spaces, and a pressure of the gas at least in the one of the plurality of spaces is different from that of the gas at least in the one of the remaining spaces; and

manufacturing a semiconductor device in a plurality of processes by using the manufacturing apparatuses.

12. The method according to claim 11, further comprising the steps of

connecting the manufacturing apparatuses by a local area network, and

communicating information about at least one of the manufacturing apparatuses between the local area network and an external network of the semiconductor manufacturing factory.

13. The method according to claim 12, wherein maintenance information of the manufacturing apparatus is acquired by data communication by accessing a database provided by a vendor or user of the exposure apparatus via the external network, or production is

managed by data communication via the external network with a semiconductor manufacturing factory other than the semiconductor manufacturing factory.

14. A semiconductor manufacturing factory comprising:

5 manufacturing apparatuses for various processes, including an exposure apparatus comprising an optical system having a plurality of spaces and a mechanism that fills each of the spaces with a gas, a gas contained at least in one of the plurality of spaces  
10 has a refractive index different from that of a gas contained at least in one of the remaining spaces, and a pressure of the gas at least in the one of the plurality of spaces is different from that of the gas at least in the one of the remaining spaces;

15 a local area network for connecting said manufacturing apparatuses; and

a gateway for allowing the local area network to access an external network of said factory,

wherein information about at least one of said  
20 manufacturing apparatuses is communicated by connection to the external network.

15. A maintenance method for an exposure apparatus installed in a semiconductor manufacturing factory and comprising an optical system having a plurality of  
25 spaces and a mechanism that fills each of the spaces with a gas, a gas contained at least in one of the plurality of spaces has a refractive index different

from that of a gas contained at least in one of the remaining spaces, and a pressure of the gas at least in the one of the plurality of spaces is different from that of the gas at least in the one of the remaining spaces, comprising the steps of:

causing a vendor or user of the exposure apparatus to provide a maintenance database connected to an external network of the semiconductor manufacturing factory;

10 authenticating access from the semiconductor manufacturing factory to the maintenance database via the external network; and

transmitting maintenance information accumulated in the maintenance database to the semiconductor manufacturing factory via the external network.

15 16. An exposure apparatus comprising an optical system having a plurality of spaces and a mechanism that fills each of the spaces with a gas, a gas contained at least in one of the plurality of spaces has a refractive index different from that of a gas contained at least in one of the remaining spaces, and a pressure of the gas at least in the one of the plurality of spaces is different from that of the gas at least in the one of the remaining spaces,

20 comprising:

25

a display;

a network interface; and

a computer for executing network software,  
wherein maintenance information to the exposure  
apparatus is communicated via a computer network.

17. The apparatus according to claim 16, wherein the  
5 network software is connected to an external network of  
a factory where the exposure apparatus is installed,  
provides on said display a user interface for accessing  
a maintenance database provided by a vendor or user of  
the exposure apparatus, and enables obtaining  
10 information from the database via the external network.